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Studies of social, economic, and policy factors affecting farming practices and technology in Iowa

Background

The Human Systems interdisciplinary research issue team, established in 1989, studies social, economic, and policy factors that affect trends in sustainable farming practices and technologies in Iowa. The team comprises social scientists from several disciplines as well as community leaders, conservationists, and farmers. The team investigates socio-economic impacts of sustainable agriculture on the structure of Iowa agriculture, farm operators and their families, agribusinesses, farm communities, social institutions, and rural culture. Not all topic areas are investigated every year.

Completed projects

The team has completed the following projects since its inception:

1. *Iowa farmers' adoption of reduced-input farming practices* (Bultena and Hoiberg): Technological change and the "industrialization" of agriculture are having profound effects on farming.

This study sought to examine Iowa farmers' commitments to the agronomic and socio-economic agendas of the alternative agriculture movement. The three major objectives were (1) to determine the nature and extent to which Iowa farmers adopt sustainable farming practices, (2) to investigate how this adoption is related to personal characteristics, farm characteristics, and values, and (3) to project the socio-economic consequences of this adoption for farm structure, farm operators and their families, and rural communities.

Data were collected from Iowa farm operators and members of four sustainable farming organizations (Practical Farmers of Iowa, Iowa Organic Crop Improvement Association, Iowa Organic Growers and Buyers Association, and Farm 2000). A total of 1067 individuals meeting farm operator eligibility criteria consented to a telephone interview; 72% of these com-

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| Leaders: <i>(1989-1993)</i> Gordon L. Bultena, Sociology, Iowa State University <i>(since 1994)</i> Steven C. Padgitt, Sociology, Iowa State University | TEAM MEMBERS Scientists: <i>Central College (Pella):</i> Janel Curry-Roper, Geography <i>Drake University (Des Moines):</i> Neil D. Hamilton, Agricultural Law <i>Iowa State University (Ames):</i> Michael Duffy, Economics Eric Hoiberg, Sociology Peter Korsching, Sociology Paul Lasley, Sociology Gayle Olson, Extension Field Specialist | <i>St. Ambrose University (Davenport):</i> Bonnie Lindemann, Ag. Decisionmaking Institute (also a farmer) <i>University of Iowa (Iowa City):</i> Cheryl Contant, Urban Planning Rebecca Roberts, Geography | Community member: Roger Engelkes, Grundy National Bank, Grundy Center Conservationist: Dale Brentnall, Isaac Walton League, Ames Farmers: Ron Rosmann, Harlan Gordon Wassenaar, Prairie City |
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pleted a follow up mail questionnaire. Among members of the four organizations involved, 177 completed telephone interviews, and 95% of these completed a companion mail questionnaire.

The investigators categorized respondents as "conventional," "sustainable," or "transitional" on the basis of criteria such as amount of fertilizers and pesticides used, crop diversity and rotations, livestock enterprises, self categorizations on a sustainability continuum, and attitudes toward conventional and sustainable farming practices. In a second phase of the study, personal interviews were conducted with a selected sample of farmers identified as using "conventional" or "sustainable" practices (see project 5 below).

Findings: No differences were found in the average ages of conventional and sustainable farmers. Slightly more sustainable farmers had completed a college education and displayed greater openness to risk-taking by adopting new and often unproved practices. Sustainable farmers also appeared to operate fewer acres and had lower gross incomes, although they typically owned a larger proportion of their farmland.

Many conventional farmers anticipated becoming less dependent on synthetic fertilizers in the future. Sustainable farmers indicated much greater reliance on organic fertilizers, both in the past and in current operations. Attitudes toward pest control practices were similar between the two groups.

Conventional and sustainable farmers display sharply divided opinions about the need for changes in agricultural production practices, with conventional farmers acknowledging a need to adjust practices but largely rejecting the need for major changes such as more complex crop rotations. In addition, most conventional farm respondents felt that the so-called negative effects of conventional practices have been overemphasized. Conversely, sustainable farmers were more likely to believe that modern agricultural practices have negatively affected the environment and that

major alterations in current practices are needed.

While conventional farmers tended to see sustainable practices as bringing diminished yields, reduced profitability, increased labor needs, and more complex decision making, many of them conceded that these practices could also reduce soil erosion and lower production costs.

In contrast, sustainable farmers were not inclined to think these practices would lower their yields or reduce their profitability. Instead, they cited benefits such as reduced costs, fewer family health problems, reduced soil erosion and compaction, and increased personal satisfaction with farming. Moreover, they viewed the need for more complex decision making as a desirable challenge. Finally, while conventional farmers projected more adverse societal impacts (such as increased domestic food prices and reduced international competitiveness) from alternative practices, sustainable farmers projected benefits such as rural community revitalization and safer food production.

2. Socioeconomic factors affecting sustainability in livestock production (Duffy, Lasley, Bultena, Hoiberg, Stewart Melvin [Manure Management team leader; see p. 35] and James Russell [Animal Management team leader; see p. 8]):

Livestock production is an integral part of sustainable farming operations, partly because animal manure is important as a natural fertilizer and also because forage crops can be fed to ruminant animals. But several factors hinder effective manure management. First, farmers lack information about management, regulations, and environmentally acceptable disposal. Timing poses challenges as well; spring and fall are busy with planting and harvesting; in summer, crops are growing; in winter, weather and regulations regarding environmentally acceptable application methods are limiting factors. Cost comparisons between manure and synthetic fertilizers are complex, given the equipment and transportation issues manure management involves. In cattle grazing sys-

terns, economic analyses are often more site-specific and hence complex than for swine production. In addition, optimal manure use places time demands on farmers. Convenience is yet another factor. Finally, manure use as fertilizer is highly dependent on farmers having livestock operations—and integrated crop-livestock operations in effect compete economically with intensive cash grain operations.

This study's objectives include assessing Iowa farmers' manure management practices, identifying the importance of selected social and economic factors in manure management decisions, and determining both farmers' receptivity to using more effective manure management practices and perceived barriers to their use.

Findings: This study provided evidence that Iowa farmers don't always use livestock efficiently to help achieve more sustainable cropping systems. For example, many otherwise sustainable farmers infrequently or never test for nutrient levels in either their soils or animal manure. In addition, many prevailing manure storage and application practices compromise the manure's nutrient quality. An especially troubling finding was that farmers who apply high levels of animal manure sometimes fail to properly adjust their applications of commercial fertilizer, thereby creating unneeded financial expenditures and also threatening water quality.

The role of the N-TRAK soil test kit — which measures nitrate levels in soil in late spring—was evaluated in terms of its effect on farm profitability.



3. *Diffusion and impacts of the late spring soil nitrate test kit (N-TRAK)* (Korsching and Contant):

One of the technologies supported by the Leopold Center's competitive grant program has been development of the late spring soil test kit, N-Trak, an on-farm technology for matching the amount of nitrogen (N) available in the soil to the current season's corn crop needs. This project examined farmers' experiences in using the test and their perceptions of its effects on farm profitability and environmental quality. It also measured fertilizer dealers' assessments of the test's impact on their business viability. Project objectives included determining characteristics of those who first adopted the technology, their levels of satisfaction with it, its effects on nutrient management decisions, and the level of farmer commitment to the test's continued use.

Investigators gathered information by several means, including a panel study of kit purchases, a survey of farm supply dealers, and a random sample survey of Iowa farmers. Follow-up contacts, including focus groups and surveys, were conducted with kit purchasers and supply dealers.

Findings: On average, N-Trak purchasers were younger than Iowa farmers in general. They had more years of formal education and higher gross incomes. Users were also generally positive about their use of the kit, with over 90% of those using it in 1990 indicating they would probably or definitely use it again in 1991.

The Extension Service and farm magazines were identified as valuable sources of information about the kit and its use. Almost half of kit users indicated they first learned about the kit from farm magazines. Their greatest motivation for using the kit was the expected savings in nitrogen application rates. A majority also indicated a desire to apply appropriate amounts of nitrogen to their corn crop. Some 60% wanted to reduce the amount of chemicals entering ground- and surface water, and over half were worried about the impact of farm chemicals on the environment in general.

N-Trak kit users found the procedure relatively easy to use, cost effective, and compatible with their farming operations. However, only 56% of them felt that the returns from using the kit exceeded the costs.

In follow-up inquiries, the investigators also found that fertilizer businesses, primarily co-operatives, earned half or less of their gross revenue from fertilizer sales and service. Environmental regulations and business profitability were the issues of greatest importance to them. Fertilizer dealers expressed the belief that farmers could reduce production expenses by more careful management of nitrogen fertilizers. A majority of the dealers were offering or considering offering soil nitrogen testing to farmers as a service. Of those already offering it, four-fifths did not charge for the service. Interest in offering the service for a fee was generally high.

Despite these positive responses, kit sales dropped off dramatically in 1991. Follow-up surveys were implemented to determine the reasons for this decline in interest. Analysis on this aspect of the research is ongoing.

In summary, improved understanding of adoption and impacts of the N-Trak kit should aid in dissemination and maintenance of other technologies related to sustainable agriculture. Better understanding of the information infrastructure is needed to support new sustainable practices. This project also recognized and clarified the role of private agribusinesses in promoting or discouraging the adoption of new technologies.

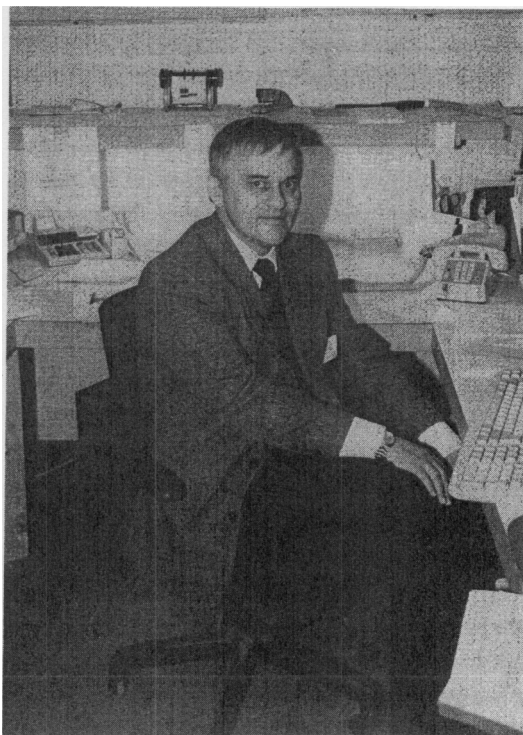
*4. Information providers * views of sustainable agriculture (Padgitt and Lasley):*

Sustainable agriculture is management and information intensive. A significant factor in farmers' acceptance or rejection of alternative practices may be their own levels of expertise as well as their ability and confidence in accessing and utilizing other sources of information. Farmers have contact with a number of publicly funded agricultural professionals who assist them in making production decisions. This research project examined how field staff in public agricultural agencies and organiza-

tions define and evaluate sustainable agriculture in their professional roles.

Study objectives included assessing knowledge and beliefs about sustainable agriculture among Iowa's public sector professionals who respond to farmers' informational needs, assessing these information providers' commitment to integrate sustainable farming concepts into their professional roles, identifying sources of information they use, identifying their educational and professional development needs and behaviors, and evaluating information diffusion strategies they use to increase farmer adoption of sustainable agriculture practices.

Questionnaires were sent to all field-based staff of selected state and federal agencies in Iowa, namely the Agricultural Stabilization and Conservation Service, the Farmers Home Administration, Soil Conservation Service, the Iowa Division of Soil Conservation, the Cooperative Extension Service, and Department of Natural Resources. Additionally, high school and community college agricultural instructors and selected media professionals were included in the study. Overall a 79% response rate was achieved.



***ISU sociologist
Steven C. Padgitt
assumed leadership
of the team in 1994.***

Findings: Based on nearly 1,000 respondents, the investigators found that the sample of information providers generally characterized Iowa agriculture as efficient in food production, but potentially harmful to the environment. A large majority felt modern farming relied too heavily on commercial fertilizers and pesticides. Most respondents also felt that they personally recognized and understood the benefits and problems of sustainable agriculture, but that in general these ideas were misunderstood by the farming community at large. Respondents also felt they had a clearer understanding of sustainable agriculture than did their clients and peers. The importance of information and education as approaches to making Iowa agriculture more sustainable was strongly endorsed. There was some variation among respondents from the different agencies in their perspectives about sustainable agriculture. For example, Extension staff members compared to staff in USDA agencies (now Consolidated Farm Service Agency, Natural Resources Conservation Services, and Rural Economic and Community Development) more often indicated sustainable agriculture was a clear and meaningful concept and that they accepted its underlying principles and practices.

In a second phase of the study, the original information provider data set was expanded to include individuals from the private farm supply sector, such as agribusinesses and cooperatives. In addition, questions were added to the Iowa Farm and Rural Life Poll to obtain perspectives from farm operators. Few differences were found between agriculture agency staff members, Iowa farmers, and agribusiness suppliers on the need to pursue sustainable production systems. There was generally consistent agreement among farmers, agricultural suppliers, and agency staff that Iowa agriculture provides reliable and affordably priced food but that it falls short of expectations in terms of conserving soil from erosion, keeping people on the land, and providing reasonable return on investment. Farmers and agricultural suppliers were more skeptical than public agency staff that profits would be maintained if reductions were made in purchased inputs such as pesticides and commercial fertilizer.

Project data show that agency staff can effectively facilitate a transition to more sustainable agricultural systems and that they are not oriented solely toward conventional farming.

5. *Impacts of sustainable agriculture on rural community viability* (Hoiberg; Bultena; Thomas Fogarty, former member, University of Northern Iowa; and Ken Root, former member, Luther College):

This study documented impacts of sustainable agricultural systems that are important to rural community viability. Long-term changes in agriculture's structure have been linked to diminished rural community vitality. A shift to more sustainable agricultural systems have been proposed as aiding preservation and even enhancement, of rural communities. But before this study, evidence was too limited to indicate whether all impacts of sustainable agriculture would be positive. Objectives included testing for differences between conventional and sustainable farmers in their purchases of farm inputs, retail goods, and services, as well as their views of likely impacts of sustainable agriculture on local communities.

Responses of the two farmer subgroups previously surveyed in 1990 and classified on the basis of their farming practices as "conventional" or "sustainable" (see project 1) were analyzed. Investigators also conducted in-depth interviews with rural community leaders, retailers, and agribusiness officials to augment the quantitative survey findings.

Findings: One key finding was that sustainable farms are smaller, on average, than conventional farms. Thus, the expansion of sustainable agriculture could serve to stabilize, or possibly reverse, long-standing population losses from farming. Greater density of sustainable farms would also bring increased demand for certain types of community goods and services, such as groceries, clothing, and hardware. But since the aggregate amount of cropland would likely remain constant under the two farming systems, demands for several types of production inputs important to conventional systems would likely decline—for example, inorganic fertilizers and pesticides. However, expansion of sustainable agricul-

ture should stimulate increased demands for other farm goods and services—livestock supplies, marketing and pest control services.

6. Value orientations: Transition and conflict in American agriculture (Lasley, Bultena, and Curry-Roper):

Various social, psychological, economic, and cultural factors affect farmers' decisions to adopt sustainable farming practices. Studies of the diffusion of new technologies frequently have assumed that farmers' values are homogeneous. Often, these studies assume that adoption is largely spurred by economics, and that practices that maximize profits are more readily adopted than those offering less financial advantage.

But farmers' adoption of sustainable farming practices is more complex than that, and major shifts in U.S. agriculture are also affecting how production decisions are made. Thus, the objectives of this research were (1) to systematically categorize Iowa farmers based on the sustainability of their agricultural practices and (2) compare the beliefs and values of "traditional" and "sustainable" farmers.

Data are from the 1989, 1990, and 1991 Iowa Farm and Rural Life Poll, which encompasses a statewide random sampling of Iowa farm operators. In this study, responses from 1,083 farmers who participated in each of the three surveys were analyzed.

Four criteria were used for classifying respondents as "traditional," "sustainable," or "mixed:"

- (1) nutrient practices—namely, use of animal manure and legumes for crop nutrients;
- (2) pest management—namely, use of integrated pest management (IPM), pest scouting and degree days;
- (3) attitudes about sustainable agriculture—namely, relationships between farming practices and natural resources, use of chemicals in modern farming, amount of attention given to harmful effects vs. benefits of pesticides, and degree of concern over food safety issues; and
- (4) self-descriptions of farm operations—namely, placement on a dichotomous con-

tinuum of organic vs. intensive chemical use.

Weights were assigned to the four dimensions, with behavioral measures considered to be stronger indicators than attitudinal assessments.

Findings: This analysis found that sustainable farmers have, on average, smaller acreages than traditional ones. Thus, the expansion of sustainable agriculture could serve to stabilize, and possibly reverse, long-standing population losses from agriculture. Further, greater density of sustainable farms also would bring demand for certain types of population-based community goods and services, such as groceries, clothing, and hardware. But since the aggregate amount of cropland is comparable under the two farming systems, demands for several types of production inputs important to conventional agriculture are likely to decline—for example, commercial fertilizer and pesticides. However, expansion of sustainable agriculture should stimulate increased demands for other farm goods and services, such as management, marketing, pest control services, and livestock supplies. This study used a separate sample and separate measurements from the "Impacts of sustainable agriculture on rural community viability" study described above, yet the findings are highly consistent.

Ongoing projects

1. Social groups, values, and agriculture (Curry-Roper):

This study, which began in 1994, is developing and testing a theoretical framework to examine how social groups having strongly shared commitments influence the beliefs and actions of their farm operator members. The investigator is combining theological and philosophical views with empirical analysis to expand understanding of the relationships among faith, communities, and the land.

Two pairs of communities were selected for the study based on the strong commitment of each to a particular theological position. The communities have fewer than 3,000 residents; are (or at least at one time were) ethnically homogeneous (e.g., German Mennonite, Swedish

ish Lutheran), and have local economies dominated by farming. The study is examining not only differences in community orientations toward farming, but the religious beliefs and value systems that undergird community differences. The methodology of discussion groups, responses to real-life scenarios, and personal interviews has allowed study participants to "tell the story" of their orientation toward agriculture and the environment. These stories are being linked to each other and to those of the community at large. Major research questions include:

- (1) Are there "communities of commitment" that are important to sustainable agriculture in Iowa? Are shared values articulated to the extent that each of the four studied communities can be distinguished from each other? Are shared values of community residents linked to theological positions of dominant churches in these communities?
- (2) Are sustainable agriculture and related issues conceptualized differently from community to community? If so, are these conceptions related to larger system beliefs?
- (3) How do "communities of commitment" shape the beliefs and actions of their farm operator members?

Data collection for this study is nearly complete, and the analysis of the case studies, which involves both descriptive and quantitative procedures, is ongoing with support from the Pew Charitable Trusts.

2. *Sustainable agriculture: households and change* (Roberts, Bultena, and Hoiberg):

The project builds on the conceptual advances and the empirical base of project 1 above, but it restates decisions regarding sustainable agriculture at the farm household level, where a number of social considerations affect decisions about the farming enterprise. This includes factors such as on-farm health concerns, farm financial situations, farm and environmental activism, accumulation of wealth and intergenerational succession strategies, and multiple income sources.

The study, which involves a critical review of adoption-diffusion literature, will identify research questions for further investigation. It will gather exploratory data using qualitative and case study approaches to develop a conceptual framework that guide a larger empirical project. Further analysis of the data base generated in project 1 above will also inform the work of this project.

3. *Sustainability of Iowa farmers on the land* (Hoiberg, Bultena, and Wallace Huff, Economics, ISU):

This project is a feasibility study to determine whether a re-study of an extensive 1976 survey of Iowa farmers would generate useful insights into characteristics of farming sustainability. Originally, extensive data were generated from nearly 1,000 farmers. A pilot follow-up study will determine the fate of farmers originally surveyed, compare and contrast the 1976 characteristics of respondents still farming vs. those who have left, and identify characteristics of farming operations that might contribute to the sustainability of farming and rural communities.

ISU Statistics Lab interviewers will make telephone contact with a randomly selected subsample of the original respondents to determine their current situations. Those farmers still actively farming will be queried regarding the current status of and major changes in their operations. Those no longer actively engaged in farming will be questioned about their reasons for leaving farming and their current social and economic status. If the pilot data appear promising, a proposal will be developed for a full-scale study.

4. *Community perceptions of water quality impacts from large-scale hog confinements* (Daniel Otto and Jan Holtkamp, Economics, ISU—new team members):

Agricultural industries are a vital component of the economy in rural areas of Iowa. Expansion of livestock operations is viewed as an economic development activity to make greater use of resources in rural areas, but such expansion is accompanied by environmental concerns. This study addresses trends and structural changes in Adams and Clarke counties.

The economic development potential of livestock expansion and the manure disposal issues associated with these structural changes will be evaluated. A second component of the study evaluates the concerns rural residents have regarding the quality of their drinking water and the perceived threat to water quality from large-scale hog confinement systems.

5. *Networking among independent swine producers—opportunities and barriers for the viability of Iowa farms* (Kendall M. Thu, Institute of Agricultural Medicine and Occupational Health and E. Paul Durrenberger, Anthropology, both University of Iowa and new members as of this project, and Padgitt):

Small-scale swine production may not be sufficiently profitable to sustain a family without off-farm income. On the other hand, large-scale production may displace family farm jobs, leading to specialization and dependence on a single commodity. As the structure of Iowa's hog industry has changed, one strategy being pursued is networking among independent swine producers in order to achieve benefits comparable to larger scale operations. Networking involves a variety of joint arrangements, including pooling of capital, sharing management and labor, and group marketing.

The success of prospective producer networks depends on the availability of accurate information on current networks, opportunities, and barriers, based on actual experiences of swine producers. This project will collect both

qualitative descriptive and quantitative data from two emerging networks. Information will be collected regarding organizational form, how networks were initiated, and how involved producers identify and assess the advantages and disadvantages of their network experiences.

Future directions

During the past year an effort has been underway to add more diverse perspectives and expertise to the team. This has resulted in the addition of nonacademic members to represent small community and agricultural interests beyond production agriculture. It has also included bringing in new academic disciplines to the work of the team.

In 1994, the team identified three new priorities: (1) structural changes associated in agriculture, particularly the social, economic, and environmental consequences of current trends toward large-scale hog operations, (2) a better understanding of interrelationships of trends in agriculture and rural social institutions and communities, and (3) policy analyses, especially regarding expiration of Conservation Reserve Program contracts. Such broad and far-reaching issues require resources beyond those within any one team. Consequently, how the team's resources can be leveraged for greater impact is an ongoing concern. Team members are also interested in tying their research more closely to those persons affected by current trends, in selection of research topics, methodologies used, and products generated.

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